

## Simplifying Expressions with Fractional Exponents

Review the rules for exponents and the steps adding, subtracting, and multiplying fractions.

### Exponent Rules

a)	$(x^m)(x^n) = x^{m+n}$	e)	$x^{-n} = \frac{1}{x^n}$
b)	$\frac{x^m}{x^n} = x^{m-n}$	g)	$x^{\frac{m}{n}} = \sqrt[n]{x^m}$
c)	$(x^m)^n = x^{mn}$	f)	$\left(\frac{b}{a}\right)^n = \frac{b^n}{a^n}$
d)	$(xy)^m = x^m y^m$		

### Steps for Adding or Subtracting Fractions

1 First find the Least Common Denominator

$$\frac{2}{3} + \frac{1}{7}$$

Least common Denominator=21

2. Rewrite the fractions with the same denominator.

$$\frac{14}{21} + \frac{3}{21}$$

3. Add or subtract the numerators

$$\frac{17}{21}$$

### Steps for Multiplying Fractions

Case 1: Multiply numerator and multiply denominators.

$$\frac{3}{8} \cdot \frac{4}{9} = \frac{12}{72} = \frac{1}{6}$$

Case 2: If possible "cross cancel" before multiplying.

$$\begin{array}{c} 1 \\ \swarrow \searrow \\ \frac{3}{8} \cdot \frac{4}{9} \\ \swarrow \searrow \\ 2 \quad 3 \end{array} = \frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$$

Example: Simplify the following expression using rational fractional exponents.

$$\left( \frac{25x^{2/3}y^3}{x^{-1/4}y^{1/3}} \right)^{1/2}$$

Solution: see exponent rules on the first page. These exponent rules are referred to in the steps below

$$\left( \frac{25x^{2/3}y^3}{x^{-1/4}y^{1/3}} \right)^{1/2}$$

$$\left( \frac{25x^{2/3}x^{1/4}y^3}{y^{1/3}} \right)^{1/2} \quad (\mathbf{ERe}) \quad \frac{1}{x^{-1/4}} = x^{1/4}$$

$$\left( \frac{25x^{11/12}y^3}{y^{1/3}} \right)^{1/2} \quad (\mathbf{ERa}) \quad \frac{2}{3} + \frac{1}{4} = \frac{8}{12} + \frac{3}{12} = \frac{11}{12}$$

$$\left( \frac{25x^{11/12}y^{8/3}}{1} \right)^{1/2} \quad (\mathbf{ERb}) \quad \frac{3}{1} - \frac{1}{3} = \frac{9}{3} - \frac{1}{3} = \frac{8}{3}$$

$$(25)^{1/2} (x^{11/12})^{1/2} (y^{8/3})^{1/2} \quad (\mathbf{ERd})$$

$$25^{1/2} x^{11/24} y^{4/3} \quad (\mathbf{ERc})$$

$$\frac{11}{12} \cdot \frac{1}{2} = \frac{11}{24}$$

$$^4 \frac{\cancel{8}}{3} \cdot \frac{1}{\cancel{2}} = \frac{4}{3} \cdot \frac{1}{1} = \frac{4}{3}$$

$$5 x^{11/24} y^{4/3} \quad (\mathbf{ERg})$$

$$25^{1/2} = \sqrt{25} = 5$$